APPENDIX

Status of Unbundled Loop and Related ILEC Tariffs, by State

Status of Unbundled Loop and Related ILEC Tariffs, by State

(see key at end of table)

State	Resale Tariff	Transport & Termination	Unbundled Loops	Unbundled Switches	Operator Services	Directory Services	911	Status
AK	•	•	•	•	•	•	•	
AL	•	•	•	•	•	•	•	
AR	•	•	•	•	•	•	•	Southwestern Bell currently negotiating with other parties for T&T.
AZ	•	BAK*						
CA	•	BAK						Beginning reseller filing process; Pacific Bell & MFS have negotiated a rate agreement
CO	•	•	•	•	•	•	•	
CT	√	BAK	P	P		√	√	Reviewing unbundled loop tariff
DC	√	•	•	•	•	•	•	
DE	√	•	•	•	•	•	•	
FL	•	√	•	•	•	•	•	
GA	•	√	P					
HI	√	•	•	•	•	•	•	Will have T&T tariff soon; only one resale tariff on file
ID	√	•	•	•	•	•	•	

(key at end of table)

State	Resale Tariff	Transport & Termination	Unbundled Loops	Unbundled Switches	Operator Services	Directory Services	911	Status
IL	√	√	P		√	√		
IN	•	•	•	•	•	•	•	Developing tariff; Ameritech has filed one
IA	•	•	•	•	•	•	•	U.S. West has been requested to file T&T tariffs.
KS	•	•	•	•	•	•	•	
KY	•	•	•	•	•	•	•	Has docket open on reseller issue
LA	√	•	•	•	•	•	•	
MA	•	•	•	•	•	•	•	Has tariff for facility based local exchanges
MD	•	√	√	√				Bell Atlantic, MFS and others have filed T&T
ME	√	•	•	•	•	•	•	
MI	•	√	√					Ameritech reseller tariff proposed
MN	√	•	•	•	•	•	•	
MO	•							
MS	•	•	•	•	•	•	•	Has applications pending for local resellers

(key at end of table)

State	Resale Tariff	Transport & Termination	Unbundled Loops	Unbundled Switches	Operator Services	Directory Services	911	Status
MT	•	•	•	•	•	•	•	Has docket open to look at local phone service competition
NC	•	•	•	•	•	•	•	
ND	•	•	•	•	•	•	•	
NE	•	•	•	•	•	•	•	
NH	•	•	•	•	•	•	•	
NM	•	•	•	•	•	•	•	
NV	•	•	•	•	•	•	•	
NY	√	√				√		
NJ	•	•	•	•	•	•	•	
OH	•	•	•	•	•	•	•	Rules have been proposed
OK	•	•	•	•	•	•	•	
OR	•	BAK						Has received resale applications
PA	•	BAK*						Bell Atlantic has pending resale tariff; AT&T filed complaint against
RI	√	•	•	•	•	•	•	In the process of dealing with local competition (Docket 2252).

(key at end of table)

State	Resale Tariff	Transport & Termination	Unbundled Loops	Unbundled Switches	Operator Services	Directory Services	911	Status
SC	•	•	•	•	•	•	•	Has received reseller applications; has tariff on shared tenant service providers
SD	•							Has reseller proposal
TN	•	BAK*						Companies have certificates to be local resellers, but none of them are active in the market at this time
TX	•	•	•	•	•	•	•	T&T tariffs are pending
UT	•	BAK						
VA	•	•	•	•	•	•	•	Has received applications for re-sellers
VT	•	•	•	•	•	•	•	
WA	•	BAK	P	•				Has reseller tariff proposal
WV	•	•	•	•	•	•	•	Working on local competition rules
WI	•	•	•	•	•	•	•	Has active resellers
WY	•	•	•	•	•	•	•	Received reseller applications

Key:

√ = state has that type of tariff or that service in the tariff.
• = state does not currently have that type of tariff.
BAK = bill and keep policy adopted on an interim basis.
BAK*= bill and keep policy recommended but state has not adopted it.
P = proposed tariff.

Source: Economists Incorporated telephone survey of state commissions.

UNBUNDLING, INTERCONNECTION, AND TRAFFIC EXCHANGE: THE PRICING OF ACCESS TO LOCAL EXCHANGE NETWORKS

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I. INTRODUCTION AND SUMMARY

Arguably, the most important feature of the Telecommunications Act of 1996 (1996 Act) is that it marks a change in attitude away from the old view—which held that incumbent telecommunications providers had to be protected from competition in order to ensure their ability to invest in new facilities and their willingness to serve all segments of the public—toward the new view that recognizes competition can generate significant benefits and should be promoted by public policy.

Telecommunications services have two notable features. First, they are provided by *systems*, which are collections of components together with interfaces that allow the components to work with one another. In a systems market, the risks and costs of entry are lower (and the degree of competition likely higher), the greater the extent to which new competitors can combine their components with those of the incumbents to offer service instead of having to offer all of the components of a complete system. Second, telecommunications services are subject to *network effects*, whereby the value of a service to any one user is an increasing function of the number of other users with whom he or she can communicate using that service.[1] Due to network effects, it is essentially impossible for a new entrant to compete successfully in the provision of local exchange services without the ability to provide its customers with the ability to make calls to, and receive calls from, the subscribers to the incumbent local exchange provider (ILEC).

As a result of the systems and network effects, the establishment of efficient arrangements for the exchange of traffic between networks and for allowing competitive local exchange carriers (CLECs) to combine ILEC facilities and services with CLEC facilities to offer end-user services is an essential prerequisite for the development of widespread competition in the provision of local exchange services. Two conditions must be satisfied for

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[1] For an overview of the economics of systems competition and network effects, see Katz and Shapiro, *Systems Competition and Network Effect*, 8 J. Econ. Persp. 93-115 (Spring 1994).

a CLEC to be able to combine components of its network with those of the ILEC to provide competitive services:

- *Interoperability*. The relevant components of the two networks must be technically or physically capable of working with one another.[2]
- *Legal Access*. Each firm must be willing to allow either the other firm or its customers to utilize the two firm's facilities jointly to provide communications services. Legal access is meaningful only if it is granted at economically reasonable prices.

If the prices of ILEC component facilities and services are set too high, then even an efficient CLEC will be unable to compete. Hence, intercarrier compensation arrangements for unbundled network elements and the exchange of traffic are a key public policy concern. There are, however, several potential costs of government intervention in the pricing of these arrangements. These costs can be summarized as:[3]

- *Potential distortions in end-user consumption choices.* The prices of unbundled elements and the terms of traffic exchange will be important drivers of the prices of services offered to end users. Improperly set prices for these intermediate services can thus distort end-user calling levels.
- *Potential distortions in provider investment choices.* The price of ILEC unbundled elements and terms for traffic exchange will drive investment

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[2] 47 U.S.C. § 256(d) mandates interoperability.

[3] See M. Katz, G. Rosston, and J. Anspacher, *Interconnecting Interoperable Systems: The Regulator's Perspective*, 4 Info., Infrastructure and Policy (1995). That paper also identified a fourth potential cost of intervention to promote interconnection: the policy may force interconnection in situations where costs exceed the benefits. Interconnection of local exchange networks is so central to the development of competition in telephony, it is hard to believe that this is a significant concern here.

incentives for incumbent firms and entrants alike. Improperly set prices can thus distort industry investment.

- *Administrative costs of regulation.* Both policy makers and private parties incur costs of designing and implementing a public policy.

The existence of these potential costs has two overarching implications for policy design. First, governmental intervention should be limited to cases in which there are clearly identified market failures. Second, where government intervention is warranted, care must be taken to design the policy to minimize these costs of the policy and maximize the net benefits derived from the public switched telephone network.

With respect to the first point, incumbent local exchange providers have market power in local exchange markets. Because a CLEC will be dependent on an ILEC to provide certain unbundled network elements or allow CLEC subscribers to communicate with ILEC subscribers, an ILEC may have the incentive and ability to deny doing so on efficient terms in order to extract economic rents from potential entrants as well as to weaken competition. The existence of this market power and the distortions in end-user consumption decisions and provider investment decisions to which its exercise can give rise warrant government oversight of these arrangements.

Turning to the second point, the nature of production costs (*i.e.*, the fact that providers are multiproduct firms whose costs exhibit economies of scale and scope) and the fact that policy makers have limited policy instruments available (*e.g.*, while policy makers can guide pricing decisions, they generally cannot—and should not—mandate that firms enter or exit a market) raise a number of difficult issues for the determination of efficient prices.

This paper examines the economics of pricing components of local exchange telephone networks and the exchange of traffic between two local exchange networks with a focus on setting prices that provide appropriate incentives for consumption and investment

decisions by private market participants. The next section demonstrates that cost causative pricing is essential to the attainment of efficiency and defines and analyzes a number of cost concepts to ascertain which ones properly serve as the basis for efficient pricing. Section III then applies this analysis to the question of how to price unbundled network elements. Section IV applies these principles to the pricing of termination and transport to suggest two simple policies (bill and keep, and a uniform price ceiling) that could be expected to guide private parties to reach efficient compensation arrangements through private negotiations. Both interim and long-term policy perspectives are addressed.

II. THE ECONOMICS OF PRICING

In order for public policy to maximize the benefits society derives from use of the public switched telephone network, it should induce compensation arrangements for unbundled network elements and the exchange of traffic that promote efficiency, both in terms of end-user consumption incentives and subscriber investment incentives. Moreover, the chosen policy should attempt to minimize its administrative costs.

A. End-user Incentives: The Efficiency of Marginal Cost Pricing

The prices of telephone services generate economic incentives that guide consumers' choices of: (1) calling levels (number of calls and duration); (2) when to call; and (3) which service providers to patronize (in those cases where there are competing ones). It is desirable to set prices that induce consumers to make those choices that maximize the net benefits derived from telephony.

Economists widely recognize that the principle of cost causation is fundamental to the efficient pricing of goods and services. The *principle of cost causation* states that the users of a service should pay for only those costs that are caused, or triggered, by the provision of

service to them.[4] This principle guides the determination of prices that induce efficient end-user choices along all three dimensions.

In the case of choosing to call for one more minute, the cost caused by that decision is the *marginal cost*, which in general refers to the additional cost incurred to produce one additional unit of calling services (here, one minute). Note that when there are call set-up costs, the marginal cost of the first minute of a call is higher than the marginal cost of ensuing minutes. In order to guide end-user decision making fully, ideally the pricing of calls would reflect this pattern of costs.

Prices set at the marginal costs of service costs provide the proper incentives with respect to if and how long to call. An end user will decide whether to continue a call by comparing the marginal benefits of another minute of calling with the price. When that price is, in turn, equal to the marginal cost of calling, the end user will consume the additional minute if and only if the benefits to him or her exceed the costs of providing the service.

Turning to the second dimension of consumer choice, the decision when to call is affected by time-of-day variation in prices. Costs, are in turn, based upon the relative demand placed upon the network at a given time. In the absence of any transactions costs, prices at each instant would reflect the level of congestion on the network at that time.

One must be careful in assessing the proper margin. For dedicated facilities, the marginal decision is likely to be something such as retaining exclusive use of the facility for another month. In this case, marginal cost pricing would entail charging a flat monthly fee set at the cost of the facility for that time span.

The pricing requirements needed to meet the third objective are somewhat different than those for the first two. The third set of incentives are properly induced by having firms with similar underlying costs charge similar prices. Note that it is the pattern of prices

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[4] In the presence of positive consumption externalities, costs need to be adjusted downward to account for the external benefits.

across carriers, rather than the relationship of any one price to the underlying cost of service that matters here. While this can be done by setting all prices at marginal cost, that is not the only way to attain the objective. In contrast, stimulating efficient calling levels is met only by setting the price of each retail service at its marginal cost.[5]

This discussion is summarized as follows. From the perspective of guiding end-user decision making, efficiency is promoted by following two fundamental rules:

1. Price *levels* should be set at marginal costs.

2. The *structure* of prices should reflect the underlying pattern of cost causation.

B. Departures from Marginal Cost Pricing

From the perspective of providing consumers with the right incentives, marginal cost pricing is efficient. This section addresses five reasons that have been put forth in support of public policies that allow prices to deviate from marginal cost:

1. Policy design must take administrative costs into account, as well as the costs resulting from the poor market performance that may be suffered pending the implementation of policies that take a long time to develop.

2. Interconnection, collocation, unbundled network elements, and intercarrier traffic exchange are inputs to the production of other telecommunications services, and thus the effects on downstream competition and pricing must be taken into account.

3. The provision of several services provided using ILEC networks may be subject to economies of scale and scope, so that marginal cost pricing may not cover a network's full economic costs.

4. Some local exchange services are priced below cost in the name of universal service policy. This raises the possibility of pricing other services above marginal cost to finance these subsidies.

5. ILECs argue that they are entitled to recover certain sunk expenditures, or legacy costs, and ILECs raise the issue of whether unbundled network elements, and charges for traffic exchange should be used to recover these costs.

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[5] Under the standard assumption that the rest of economy can be taken to be competitive.

1. Administrative and Transactions Cost Considerations

This consideration implies that one should not overdo fine tuning. For example, as noted above, in the absence of any transactions costs, prices at each instant would reflect the level of congestion on the network at that time. Such pricing is, of course, impractical, and an actual pricing scheme must balance administrative and transactions costs against any benefits of fine tuning prices. Other costs arise from delaying the implementation of policies that, while not perfect, are better than the unregulated market outcome.

2. The link between interconnection pricing and end-user prices

End-user consumption decisions are driven by retail service prices. Thus, it is important to understand the link between retail prices and the compensation terms for unbundled network elements and intercarrier traffic exchange. Three important considerations arise.

One, for the near future, end-user services will be provided under conditions of imperfect competition. Consequently, absent regulation to the contrary, service providers generally will charge a mark up over their costs. Economists analyzing this situation have noted that to get efficient retail prices (equal to marginal costs) it may be optimal to price inputs such as transport and termination *below* marginal cost.[6] Even if one is not prepared to conclude that policy should explicitly aim to subsidize unbundled network elements and transport and termination, this fact does imply that, at least in terms of end-user consumption decisions, there is relatively less threat to consumption efficiency from pricing such facilities and services "too low."

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[6] See, for example, J.J. Laffont and J. Tirole, *Creating Competition Through Interconnection: Theory and Practice*, Section 9.1 (Dec. 1994) (unpublished manuscript); J. Arnback, B. Mitchell, W. Neu, K.H. Neumann, and I. Vogelsang, *Network Interconnection and the Domain of ONP*, Final Report Section 3.5. (Nov. 1994) (study conducted for DG XIII of the European Commission

The second implication is that peak-load pricing for interconnection and traffic exchange will not generate consumption efficiency benefits unless this pricing structure is reflected in *retail* rates. If the Commission were to adopt a complicated switch-dependent peak-load pricing scheme that fully mirrored the underlying pattern of cost causation, it is unlikely that retail rates would in turn mirror it. In this case, there might be little benefit relative to the administrative costs of the complicated peak-load pricing scheme.

The third consideration has to do with the need to promote competitive neutrality. When consumers are sensitive to differences in retail prices across providers, it is important to minimize distortions in competition between ILECs and CLECs to the extent practicable.

3. Economies of Scale and Scope

In addition to considering prices that induce end users to make efficient consumption decisions, it is important to examine the effects of prices on provider investment incentives. Because providers often make decisions (*e.g.*, the choice of whether to enter a new market or offer a new service) that are not marginal, it is important to develop additional cost concepts based on the principle of cost causation.

(i) Incremental Costs

The notion of incremental cost is closely tied to the notion of cost causation. In order to ascertain the costs triggered by the provision of certain units of a service, one compares the costs of production with and without those units. The difference in total costs is the amount that can be attributed to those units of service and is known as the *incremental cost*.[7] As the Commission has stated,

> "[i]ncremental cost is a more general concept than marginal cost. Incremental cost is the cost ascribable to any specified change in volume of output or

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[7] Formally, let $C(X_1, X_2, \ldots, X_n)$ denote the total cost of producing X_1 units of service 1, X_2 units of service 2, and so on. Then the incremental cost of increment Y_i is $C(X_1,\ldots X_{i-1}, X_i + Y_i, X_{i+1},\ldots X_n) - C(X_1,\ldots X_{i-1}, X_i, X_{i+1},\ldots X_n)$.

service, whereas marginal cost is the limit of that increment, as the change in volume approaches zero."[8]

The incremental cost of a service is affected by at least three dimensions of choice:

- *Baseline mix of service* The baseline specifies the mix of services that is held constant in looking at total costs with and without production of the incremental units of service.
- *Definition of the increment.* The definition of the increment depends on both the service definition and the traffic volume.
- *Time Frame Considered.* The time frame considered matters because it affects the choices open to the firm as well as what expenditures count as economic, or opportunity, costs.

This paper will have more to say about the baseline mix and the choice of increment below. Before doing so, it is useful to consider the decision time frame. Telecommunications firms make production decisions in a dynamic, rather than static, environment. Hence, one must account for the decision time frame in assessing costs.

Short-Run v. Long Run Costs. A firm's costs are its expenditures on inputs needed to produce output. The firm will attempt choose the least expensive combination capable of producing the desired output The input choices available to the firm depend in part on the length of its decision making horizon. In general, the more time a firm has to make its input decisions, the more options it is has—the more factors will be variable rather than fixed. For example, over the course of a week, the number of end offices is fixed. But given sufficient time, additional end offices could be constructed.

Economists define the *long run* as a period of time of sufficient length that all inputs can be varied and none is fixed. The length of time needed to reach the long run depends on

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[8] American Telephone & Telegraph Company, Long Lines Department, Memorandum Opinion and Order, 61 F.C.C. 2d 587, 628 n.70 (1976), aff'd. 70 F.C.C. 2d 616 (1979).

the particular technology and the markets in which the firm buys its inputs. Economics textbooks define the *short run* as a time period over which the quantity of one input can be varied, but the quantities of all of the firm's other factors of production cannot be adjusted.[9] Because telephone service providers use many different inputs to produce their output, it is possible to have "medium runs" in which several factors are variable while several others are not. An important point to keep in mind is that the longer the firm's decision-making horizon, the greater are its options.

Short-run costs refer to the costs that are relevant for a short-run decision-making horizon,[10] while *long-run costs* refers to the costs that are relevant for a long-term decision-making horizon. There are two differences in the firm's short- and long-run costs of producing a given level of output that arise because of differences in the options available to it:[11]

1. In the short run the levels of many inputs (capital inputs, in particular) are fixed. Since these fixed factors have no alternative uses, expenditures made by the firm on them are sunk and thus are not economic (opportunity) costs. In the long run, however, all input levels are variable, there are no sunk expenditures, and everything counts as an economic cost. Because more things get counted as costs, this effect raises long-run economic cost relative to short-run economic cost.
2. The firm has a greater number of input options available in the long run, and this increased flexibility tends to lower the costs of producing output.

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[9] See, for example, M. Katz and H. Rosen, Intermediate Microeconomics, 2nd. ed., 249, Burr Ridge: Richard D. Irwin (1994).

[10] Discussions of telecommunications policy sometimes loosely refer to what might technically be called medium-run costs as short-run costs.

[11] Katz and Rosen, *op. cit.* 293.

In terms of their effects on the relation between the short- and long-run total cost curves, these two forces run in opposite directions. Consequently, in some instances the short-run cost of producing a given level of output may be greater than the long-run cost (*e.g.*, when the provider is up against a capacity constraint), while in other cases the relationship will be the reverse (*e.g.*, because the short-run cost does not contain any allowance for the recovery of sunk capital expenditures)

Forward Looking v. Embedded Costs. Economic costs are generally *forward-looking costs* or opportunity costs. That is, the costs are based on the options available to the firm at the time (which, in turn, depend on current input prices, and technology), and do not account for sunk expenditures. In contrast, *embedded costs* take into account expenditures made in the past. There are two reasons that embedded costs generally diverge from economic costs. First, they include sunk expenditures, which are not economic costs. Second, they rely on historical values for input costs even when those costs have since changed. Thus, embedded costs do not represent the resource cost to society of supplying a service.

A Competitive Cost Basis. Armed with these definitions, the effects of pricing on investment incentives can be explored. A profit-maximizing competitive firm entering a market will base its investment and pricing decisions on forward-looking, long-run costs. That is, the firm will base its costs on current input prices and technology, not those of the past. Moreover, it will examine whether its revenues can be expected to cover the costs of all of the inputs that it will need to serve the market.

(ii) Single-Product Firms

At this point, it is useful to consider the relatively simple case of a single-service market. Suppose that production exhibits *economies of scale,* whereby average costs decline as the firm increases its output. Then the marginal cost will be less than average

cost, and pricing at marginal cost will not allow the firm to cover its costs. Absent the ability to subsidize a firm, public policy makers may have no choice but to let the firm raise its price until it is at a point where, at the resulting quantity on the demand curve, the price is equal to average cost. This outcome minimizes the inefficiency associated with setting price greater than marginal cost in order to allow the firm to recover its costs.

This result can also be expressed in terms incremental costs. The *total service incremental cost* refers to the value of incremental cost when the increment is defined to be an entire service.[12] For pricing policy purposes, it also is useful to introduce the notion of *average incremental cost*, which is the cost per-unit of producing a given amount of output above some base level.[13] The total service average incremental cost is simply the average incremental cost when the increment is an entire service.

Setting price equal to total service long-run average incremental cost would allow a single-product firm to recover all of its operating expenses and investment costs, because for a single-product firm the total service incremental cost is equal to total cost. Of course, allowing an ILEC to cover its (non-marginal) costs comes at a price: consumption levels are suppressed below what would be optimal solely from the perspective of consumption efficiency.[14]

Consider too, the effects of pricing on CLEC investment incentives. These incentives have to be considered both in terms of investing in facilities to substitute for those of the

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[12] Formally, the total service incremental cost of service i is defined as $C(X_1, X_2, \ldots, X_n) - C(X_1, \ldots X_{i-1}, 0, X_{i+1}, \ldots X_n)$, where C denotes total costs. Note that for later reference this is the formal definition in its general, multiproduct form.

[13] Algebraically, the average incremental cost of increment Y_i is $[C(X_1, \ldots X_{i-1}, X_i + Y_i, X_{i+1}, \ldots X_n) - C(X_1, \ldots X_{i-1}, X_i, X_{i+1}, \ldots X_n)]/Y_i$.

[14] In addition to suppressing marginal consumption levels, pricing at long-run total service average incremental cost is not in general a valid means of assessing the desirability of producing the service overall. In the presence of consumer surplus, producer revenues may be less than total service long-run average incremental costs even when gross social benefits are greater.

ILEC and investing in facilities to be used as complements to ILEC facilities. First consider the incentives to construct substitute facilities. Where regulation keeps prices below the incumbents' total service long-run average incremental costs, even a potential entrant that is more efficient than the ILEC may be deterred from entry. Likewise, where prices are above ILEC total service long-run average incremental costs, entry may be encouraged even when the entrant has higher costs than does the incumbent (*e.g.*, there may be inefficient bypass).[15] In addition to distorting rivals' incentives to construct facilities that substitute for those of the ILEC, rates above total service long-run average incremental costs will reduce the overall incentives to invest in CLEC facilities that are complementary to ILEC facilities in the sense that they are jointly used to provide end-user services. Consequently, CLEC investment needed to bring local exchange competition could be delayed or reduced, thus diminishing the efficiency benefits that competition would otherwise generate.

Lastly, it should be noted that CLECs' incentives to invest in facilities to provide local exchange competition may be too low from a social perspective because such competition can be expected to increase consumer surplus (*i.e.*, the benefits that are enjoyed by end users and not appropriated by providers). This increase is a social benefit, but not a private benefit to the firm, and the latter is what matters for investment incentives. Hence, there can be situations in which investment would be socially desirable but a private firm would not undertake the project. This pattern raises the possibility of welfare-improving subsidies to CLEC investment in the form of lower prices for the use of the ILEC facilities and services needed to compete.[16] While this theoretical possibility does not mean that

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[15] There can, however, be social benefits even from entry by an inefficient entrant. These efficiency benefits arise when entry induces the incumbent lower its prices to levels closer to costs.

[16] See, for example, J.J. Laffont and J. Tirole, *Access pricing and competition*, 38 European Econ. Rev. (1994) and Laffont and Tirole 1693 Section 9.2 (December 1994), *op. cit.*

subsidies are a good idea in practice, it does indicate that one should be cautious about overstating the misincentives from lower prices.

(iii) Multiproduct Firms

Local exchange carriers are multiproduct firms, which raises issues of cost recovery across services, as well as across units of a single service. When it is cheaper to produce two products together in one firm rather than separately in two specialized firms, costs are said to exhibit *economies of scope*. Economies of scope arise when different services are able to make use of shared or common inputs and thus amortize the costs of these inputs over a larger number of units For a single product firm, economies of scale raise a cost recovery issue because pricing at long-run marginal cost will not cover the firm's total costs. For a multiproduct firm, economies of scope raise a cost recovery issue because pricing at total service long-run average incremental cost will not recover total costs.

To examine this issue further, common costs need to be defined more precisely. The *stand-alone cost* of a service is the cost of providing that service in isolation. In other words, it is the total service incremental cost given that the baseline levels of all other services are zero. One can also define the stand-alone costs of a *set* of services in an exactly analogous way.

The *common costs* of two services or sets of services can be defined as the sum of the stand-alone costs for the two product sets minus the cost of producing them together in a single firm. This definition brings out the fact that common costs represent a cost savings because they only have to be incurred once, rather than twice, when the two sets of services

are provided together, rather than separately.[17] Notice that, under this definition, common costs are positive if and only if there are economies of scope.

The key fact for pricing purposes is that common costs are also equal to the difference between the total cost of producing the two sets together and the sum of the two incremental costs.[18] This fact means that, in the presence of economies of scope, the sum of the incremental costs of the two service sets is less than the cost of producing the services together. In other words, in the presence of economies of scope, pricing each service at its total service long-run average incremental cost will not recover the total costs incurred by the firm. An issue for a multiproduct firm is how to recover common costs across products.

Costs that cannot be assigned on the basis of cost causation to any one service or set of services are also known as *overheads*. In this regard, it should be noted that much of what is called overhead in practice, is not overhead in the strict economic sense. To the extent that so-called overhead (*e.g.*, corporate legal expenses) vary with the levels of output or some other activities, the principle of cost causation tells us that the amount of these changes should be included in the calculation of incremental cost and related measures.

Before going further, it is important to recognize that incremental costs and stand-alone costs depend critically on the service definition used to define them. For example, the sum of the stand-alone costs calculated for each residential subscriber would be huge. And, loosely speaking, narrower service definitions will tend to have lower incremental costs. All of this means that the size of common costs—and the extent by which average incremental

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[17] Because these costs are incurred to produce more than one product (or set of services), common costs also are referred to as *shared costs*. If products A and B are produced only in fixed proportions, their common costs are referred to by the Commission and telecommunications industry as *joint costs*. See Separation of Costs of Regulated Telephone Service From Costs of Nonregulated Activities, Notice of Proposed Rulemaking 104 F.C.C. 2d 59, 61 n.2 (1986), citing A. Kahn, 1 Econ. of Regulation at 77-79 (1970).

[18] In either case, one has C(X,0) + C(0,Y) - C(X,Y), where X and Y are the respective product sets.

cost pricing will fail to cover total costs—depend critically on the service definition. For example, "local exchange services on Monday" and "local exchange services the rest of the week" would have very large common costs. On the other hand, "local loop services" and "interoffice trunking" might have very little common costs.[19] Thus, it is essential that policy makers carefully consider the service definitions used to assess incremental and common costs. Unfortunately the only way to guarantee that the concepts of incremental and stand-alone costs are properly applied is to look at all combinations of services.[20]

Allocating the Inallocable. ILECs and CLECs must earn an adequate return on local infrastructure investment if they are to continue investing in the local exchange facilities used to produce a variety of services, including interexchange access, CMRS interconnection, and local telephone service. In the presence of economies of scope, pricing each of these services at its total service long-run average incremental cost would fail to cover the full costs of production. Consequently, some or all of the services would have to be priced above total service long-run average incremental cost in order to cover common costs or overheads.[21] *Contribution* refers to the amount by which the revenue generated from the sale of an increment of service exceeds the cost of that increment and thus can be used to

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[19] This type of issue is also discussed in AT&T Submission, "Interconnection, Unbundling and Total Service Resale" at 50 (March 18, 1996).

[20] For more on this point, see W. Baumol, J. Panzar and R. Willig. Contestable Markets And the Theory of Industry Structure, 352-353, New York: Harcourt Brace Jovanovich, Inc. (1982).

[21] As noted in the previous subsection, if the services are defined broadly, however (*e.g.*, unbundled local loop), pricing at total service long-run average incremental cost may come close to covering total costs.

recover overheads or common costs (or increase profits). Determining the pattern of contribution across services is both important and extremely difficult.[22]

For the reasons given above, by raising prices above incremental costs, any overhead loadings will suppress consumption below efficient levels and distort CLEC investment incentives. Hence, it is important that ILECs not be allowed to overstate common costs. Thus, the Commission should carefully examine the revenues of the full range of services offered using ILEC facilities, including both regulated and unregulated activities, as well as interstate and intrastate. There is simply no other way to ensure that ILECs are not over-recovering costs.

It is also important to assess contributions in a way that minimizes the efficiency losses associated with the overall amount of revenue raised. The term *fully distributed costs* refers to systems of cost assignment in which *all* costs recorded in the books of account, including sunk investment and general overheads, are allocated among products and services, or combinations of categories of products and services.[23] Fully distributed costs represent an attempt to allocate costs that cannot be allocated by principles of cost-causation alone. Many attempts to do so notwithstanding, there is no correct, efficient, or scientific way to allocate common costs among individual products based solely on the examination of the

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[22] In practice, it can also be difficult to determine which costs are attributable to a specific service and which are common. For example, this issue arises in the Commission's most recent Notice of Proposed Rulemaking on video programming cost allocation. See Allocation of Costs Associated with Local Exchange Carrier Provision of Video Programming Services, Notice of Proposed Rulemaking, CC Docket No. 96-112, FCC No. 96-214 at 21 (released May 10, 1996). At issue, *inter alia*, is whether these spare facilities should be fully assigned to regulated activities on the basis of cost causation, should be assigned to both regulated and unregulated services on the basis of cost causation, or should be viewed as shared facilities between regulated and unregulated activities, at least on a forward-looking basis. If these are common costs, then an allocation issue arises and it is quite unlikely that a 100 percent allocation to regulated services is efficient.

[23] See, e.g., Separation of Costs of Regulated Telephone Service from Costs of Nonregulated Activities, Report and Order, 2 FCC Rcd 1298, 1310-11 (1987), recon. 2 FCC Rcd 6283 (1987); further recon., 3 FCC Rcd 6701 (1988), aff'd sub. nom. Southwestern Bell Corp. v. FCC, 896 F.2d 1378 (D.C. Cir. 1990).